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Conference Abstract

First for Stroke: using the Microsoft 'Kinect' as a facial paralysis stroke rehabilitation tool

Philip Breedon, *Nottingham Trent University, United Kingdom*

Adam Russell, *Nottingham Trent University, United Kingdom*

Pip Logan, *University of Nottingham, United Kingdom*

Ossie Newell, *University of Nottingham, United Kingdom*

Becca O'Brien, *Nottingham Citycare Partnership, United Kingdom*

Judi Edmans, *University of Nottingham, United Kingdom*

Darrin Baines, *University of Nottingham, United Kingdom*

Patrick Hall, *Maddison Product Design, United Kingdom*

Correspondence to: ***Philip Breedon,*** *Nottingham Trent University, United Kingdom, E-mail: philip.breedon@ntu.ac.uk*

Abstract

There are around 152,000 incidents of stroke each year in the UK, with 16% of cases having long lasting facial weakness. Most strokes occur after 65 years of age and with people living longer the number of sufferers will continue to increase, making cost effective community rehabilitation a higher priority. This project is developing a new rehabilitation intervention for use by stroke patients, using the Microsoft Kinect camera and a PC monitor to provide interactive feedback in a programme of rehabilitation exercises configured uniquely for each user. The system provides multimodal interaction to support varied patient symptoms with physical remote control, hand-gesture control and voice activation options.

The system compares the patient's live facial expression with a 'palette' of preconfigured facial poses. We derive our exercises to 'match strengths' against multiple target poses in real-time. This forms the basis of our rehabilitation exercise definitions, allowing clinicians to customise an exercise programme for an individual patient in just the same way that they might currently (e.g. alternate 5 times between 'oo' and 'ee' mouth shapes, holding each for 3 seconds). Pre-recorded video clips of a real therapist are used on-screen to guide the patient through the exercises and to provide feedback on how well they performed. The device transmits usage monitoring data in situ from the patient's home to a remote database using mobile data networks. This data is remotely accessible by clinicians via a simple web interface so they can assess and monitor the patient's ongoing treatment and compare this with the advised usage to rapidly identify compliance issues without requiring site visits.

This project seeks to develop a system that supports NHS policy to deliver more tailored services in the community and improve the quality of rehabilitation regimes. Essential to system development have been regular meetings and discussions with the projects' PPI group, presenting them with live demos and involving them in the iterative design of the user interface from the earliest concept stages. Critical to our approach throughout has been to show our PPI group tangible work-in-progress, frame questions which feed directly into our ongoing design process resulting in taking note of their very valuable and personal feedback which then plays a key role in informing our system design strategy. This has resulted in hugely positive feedback from the PPI members, who in the space of just six months have seen our work evolve in response to their input. The project has produced an interim commercialisation study which showed a recurring interest amongst service providers in reducing the cost of SLT time spent on delivery of care. For example the Managing Director of one community services provider stated "if a device or system demonstrates that it can improve outcomes with less SLT time it will be of interest".

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Keywords

stroke; facial paralysis; rehabilitation; Kinect system; intervention

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